CLAIMS

1. A method of detecting target-probe interactions comprising:

   (a) providing a filament with a first probe disposed thereon;
   (b) traversing the filament through a first chamber, wherein the first chamber contains the target in solution; and
   (c) assessing binding of the target to the first probe.

2. The method of claim 1, wherein the first probe is disposed on the filament in an annular fashion.

3. The method of claim 1, wherein the first probe is associated with a probe identifier.

4. The method of claim 1, wherein the filament has a plurality of different probes disposed thereon.

5. The method of claim 4, wherein the plurality of different probes are disposed in a single ring around the filament.

6. The method of claim 5, wherein each of the plurality of different probes is associated with a distinct probe identifier.

7. The method of claim 1, further comprising traversing the filament through a second chamber, wherein the second chamber contains a solution that lacks the target.

8. The method of claim 7, wherein the second chamber comprises a solution for pre-processing or post-processing of the filament.

9. The method of claim 8, wherein the preprocessing comprises making an array, chemical blocking of a reactive group on the target, ionic blocking of a target, or denaturing of a target.

10. The method of claim 8, wherein the post-processing comprises deblocking of a reactive group on the target, removal of an ionic blocker, or renaturing of a target molecule.

11. The method of claim 1, wherein the target is labeled with a fluorescent label, a chemilluminescent label, a radioactive label, a magnetic label, or a spin resonance label.

12. The method of claim 3, wherein the probe identifier is a bar code.

13. The method of claim 12, wherein the bar code is disposed in an annular fashion.

14. The method of claim 12, wherein the bar code is disposed in a linear fashion.

15. The method of claim 1, further comprising convective transport of the target solution by means of filament movement through the first chamber.

16. The method of claim 1, wherein the filament comprises surface features to enhance mixing of the target solution.

17. The method of claim 1, wherein the first chamber comprises surface features to enhance mixing of the target solution.

18. The method of claim 1, wherein the filament is transparent.

19. The method of claim 1, wherein the filament is adapted to incorporate an electrical charge.

20. The method of claim 19, further comprising subjecting the target to electrophoretic movement.

21. The method of claim 20, wherein the electrophoretic movement promotes target-probe interaction.

22. The method of claim 20, wherein the electrophoretic movement inhibits target-probe interaction.

23. The method of claim 1, further comprising a second traversing of the filament through a chamber comprising the target.

24. The method of claim 23, wherein the chamber used for the second traversing is the same chamber in step (b).

25. The method of claim 23, wherein the chamber used for the second traversing is a different chamber than in step (b).

26. The method of claim 23, wherein the temperature in the chamber used for the second traversing is altered from that used in step (b).

27. The method of claim 23, wherein the charge in the chamber used for the second traversing is altered from that used in step (b).

28. The method of claim 23, wherein the current, amperage, voltage or polarity in the chamber used for the second traversing is altered from that used in step (b).

29. The method of claim 15, further comprising re-circulating target solution from the first chamber.

30. The method of claim 1, further comprising enhancing detection of binding of the target to the first immobilized probe.

31. The method of claim 30, wherein enhancing comprises traversing the filament through a second processing chamber that contains

(i) a second liquid phase probe that binds to the target at a location distinct from the first probe, and wherein the second liquid phase probe contains a binding site for a third liquid phase probe; and

(ii) a third liquid phase probe that is detectable.

32. The method of claim 31, wherein the third liquid phase probe is provided in an inactive state and then activated to facilitate amplification.

33. The method of claim 32, wherein the third liquid phase probe is labeled with a fluorescent, a chemilluminescent or a radioactive molecule.

34. The method of claim 32, wherein the third liquid phase probe is a linear molecule with a binding site for itself.

35. The method of claim 32, wherein the third liquid phase probe is a branched molecule with multiple binding sites for itself.

36. The method of claim 1, wherein the filament is 1 μm to about 0.5 cm in diameter.

37. The method of claim 1, wherein the processing chamber is greater than 1 μm in diameter and less than 2.0 cm.

38. The method of claim 1, wherein the target solution in the processing chamber is present in a volume of less than 100 μl.

39. The method of claim 1, wherein the fiber comprises an axial or radial probe density of greater than 1 probe region per cm.

40. An apparatus comprising one or more chambers, each chamber comprising two surface tension valves permitting a filament to move into and out of the chamber.

41. The apparatus of claim 40, comprising a processing chamber and a wash chamber.

42. The apparatus of claim 40, comprising a first processing chamber and a second processing chamber.

43. The apparatus of claim 40, comprising a processing chamber and an amplification chamber.

44. The apparatus of claim 40, further comprising a signal detection device.

45. The apparatus of claim 44, wherein the signal detection device comprises an optical sensor.

46. The apparatus of claim 40, further comprising a signal generating device.

47. The apparatus of claim 46, wherein the signal generating device is an electromagnetic radiation source.

48. The apparatus of claim 47, wherein the electromagnetic radiation source is a laser.

49. The apparatus of claim 40, wherein the each of the chambers comprises a sealable port, distinct from the surface tension valve, for the insertion or withdrawal of a solution.

50. A filament having a substantially cylindrical shape with a first set of identical probes disposed on the filament in an annular fashion.

51. The filament of claim 50, further comprising a second set of identical probes disposed on the filament in an annular fashion.

52. The filament of claim 51, further comprising a third set of identical probes disposed on the filament in an annular fashion.

53. The filament of claim 52, further comprising a fourth set of identical probes disposed on the filament in an annular fashion.

54. The filament of claim 53, further comprising a fifth, sixth, seventh, eighth, ninth and tenth set of identical probes disposed on the filament in an annular fashion.

55. The filament of claim 51, further comprising a probe identifier associated with each set of probes.

56. The filament of claim 55, wherein the probed identifier is a bar code.

57. The filament of claim 50, wherein the probe is a nucleic acid or mimetic.

58. The filament of claim 57, wherein the nucleic acid is a DNA or an RNA.

59. The filament of claim 50, wherein the probe is a peptide or protein or mimetic.

60. The filament of claim 50, wherein the filament is transparent.

61. The filament of claim 50, wherein the filament comprises one or more surface features selected from the group consisting of pores, abrasions, invaginations or protrusions.

62. A system for assessing target-probe interactions comprising:

(a) a first processing chamber comprising first and second surface tension valves permitting a filament to move into and out of the chamber;
(b) a filament disposed in the first processing chamber, passing through the first and second surface tension valves; said filament having probes disposed thereon in an annular fashion; and
(c) a device for identifying target-probe interactions on the filament.

63. The system of claim 62, further comprising a washing chamber comprising first and second surface tension valves permitting a filament to move into and out of the chamber.

64. The system of claim 62, further comprising a second processing chamber comprising first and second surface tension valves permitting a filament to move into and out of the chamber.

65. The system of claim 62, wherein the device for identifying target-probe interactions is an excitation source coupled to an emission sensor.

66. The system of claim 65, wherein the excitation source is an electromagnetic, chemical, enzymatic excitation or light source.

67. The system of claim 66, wherein the light source is a laser.

69. The system of claim 62, wherein the filament further comprises a probe identifier associated with a particular probe type.

70. The system of claim 62, further comprising one or more pumps operably connected to the processing chamber by a tube and/or valve, facilitating filling or draining of the processing chamber with a solution.

71. The system of claim 63, further comprising a device that facilitates transport of the filament through the first processing chamber.

72. The system of claim 62, further comprising a device for applying a first electrical charge to the filament.

73. The system of claim 72, further comprising a second device for applying a second electrical charge to the filament, the second electrical charge being opposite that of the first electrical charge.

74. The system of claim 62, further comprising a device for subjecting a target in solution in the processing chamber to electrophoretic transport.

75. The system of claim 62, wherein said filament is looped to facilitate repeated exposure to the first processing chamber.

76. The system of claim 62, wherein the target and probe are nucleic acids.

77. The system of claim 62, wherein the target and probe are proteins.

78. The system of claim 62, further comprising a computer that controls one or more of:

(i) filament movement;
(ii) filling or draining of the processing chamber;
(iii) temperature of a solution in the processing chamber;
(iv) charge on the filament;
(v) electrophoretic transport of the target;
(vi) analysis of a signal resulting from target-probe binding; and
(vii) signal amplification.